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SPECIAL ARTICLES

A METHOD OF STUDYING THE ABSORPTION-TRANSPIRATION RATIO IN NUTRIENT MEDIA

SEVERAL writers have shown that the water content of plants varies with the hour of the day. This variation is of course due to differences in the rates of water entrance and exit. Wilting takes place when the ratio of the rate of entrance to the rate of exit is less than unity whether caused by excessive transpiration or by a decrease in root absorption. These two plant processes may easily be studied as a laboratory exercise in plant physiology by using water culture plants exposed to different environmental conditions or placed in solutions of different osmotic pressures. The following experiment will serve to illustrate the manner in which changes in the strength of solutions affect the ratio of absorption to transpiration. The method here described is practically the same as one used by the writer in a series of experiments reported by Livingston.¹

The roots of a tomato plant were passed through a hole in the rubber stopper of a large mouth bottle of about 600 c.c. capacity. A water-tight seal of chewing gum was made around the stem of the plant; a 2 c.c. pipette, graduated to 1/20 c.c. and a thermometer were inserted into the bottle through the stopper.

¹Livingston, B. E., "Incipient Drying and Temporary and Permanent Wilting of Plants, as Related to External and Internal Conditions," Johns Hopkins Univ. Cir., March, 1917, pp. 176-82.

The bottle and pipette were then filled with the nutrient solution, care being taken that no bubbles were inclosed beneath the stopper. Loss in weight of the plant and container gave the amount of transpiration, while the loss of solution from the pipette gave the amount of root absorption after temperature corrections were made. These temperature corrections were made by comparing these pipette readings with those of a pipette in a similar bottle containing no plant, but exposed to the same set of conditions. Transpiration was measured in grams while absorption was measured in cubic centimeters, but as the variations in density of the solutions for these temperature ranges were small in comparison to the actual values dealt with this correction was not made. The experiment was performed on November 6, 1919, in the diffused light of the laboratory during a period when variations in temperature and the index of evaporation were slight.

TABLE I

Data Showing Rates of Transpiration and Absorption of a Tomato Plant with Roots Immersed Successively in a Three-salt Nutrient Solution of 1.75 Atmospheres Osmotic Pressure, Cane Sugar Solution of 5.06 Atmospheres Osmotic Pressure and Distilled Water

Period	Hourly Rate of		Ratio A/T	Solution and Osmotic Pressure
	Transpiration	Absorption		
	<i>gram</i>	<i>cc.</i>		
1	.41	.44	1.07	3-salt, 1.75 atm.
2	.31	.37	1.19	3-salt, 1.75 atm.
3	.42	.28	.67	Sugar, 5.06 atm.
4	.29	.18	.62	Sugar, 5.06 atm.
5	.41	.46	1.12	Distilled water
6	.32	.39	1.22	Distilled water

When the hourly rate of absorption is in excess of transpiration the ratio, A/T , is greater than unity and the plant cells increase in turgor. When this rate is less than unity turgor is decreased and if the process is continued long enough the cells become flaccid and the plant is seen to wilt. The plant gained in turgor during the first two periods given in Table I., but during the third and fourth

periods the ratio values decreased very much. This decrease was mainly due to lower absorption rates since the roots were surrounded by a solution much stronger osmotically during these two periods than during the first two. The rates of absorption for the last two periods were greatly increased by placing the roots in distilled water.

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THE AMERICAN MATHEMATICAL SOCIETY

THE two hundred and twelfth regular meeting of the society was held at Columbia University on Saturday, October 30, 1920, extending through the usual morning and afternoon sessions. The attendance included thirty-five members. President Morley occupied the chair. The council announced the election of the following persons to membership in the society: Dr. P. M. Batchelder, University of Texas; Miss Vevia Blair, Horace Mann School; Mr. E. H. Carus, La Salle, Ill.; Mr. W. E. Cederberg, University of Wisconsin; Mr. R. P. Conkling, Newark Technical School; Mr. P. H. Evans, Northwestern Mutual Life Insurance Company, Milwaukee, Wis.; Mr. B. L. Falconer, U. S. Civil Service Commission, Boston, Mass.; Mr. J. A. Foberg, Crane Junior College, Chicago, Ill.; Dr. Gladys E. C. Gibbens, University of Minnesota; Professor L. E. Gurney, University of the Philippines; Professor Archibald Henderson, University of North Carolina; Miss Jewell C. Hughes, University of Arkansas; Miss Claribel Kendall, University of Colorado; Mrs. M. I. Logsdon, University of Chicago; Mr. R. L. McNeal, General Motors Laboratories, Detroit, Mich.; Mr. H. L. Olson, University of Michigan; Professor Leigh Page, Yale University; Captain H. W. Rehm, Aberdeen Proving Ground, Md.; Mr. Irwin Roman, Northwestern University; Mr. Raleigh Schorling, Lincoln School, New York City; Mr. E. L. Thompson, Junior College, Joliet, Ill.; Dr. Bird M.